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\$9.50 per month for 72 months, the first payment to be made at the end of the first month. What rate of interest does *A* pay? The Association claims to charge only 8 per cent. (the legal rate in Alabama). How can 8 per cent. be figured out on the above.

47. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

Mr. Merchant sells 20% above cost, with weights and measures  $12\frac{1}{2}\%$  "short," allows a discount of \$5 on every bill of \$50, and loses 5% of his sales as "bad debts." Find his *rate per cent* of net profit, or net loss; one cent in every dollar of sale proves counterfit, and collection-charges are  $2\frac{1}{2}\%$ .

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## ALGEBRA.

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Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

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### SOLUTIONS OF PROBLEMS.

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36. Proposed by J. A. CALDERHEAD, B. Sc., Superintendent of Schools, Limaville, Ohio.

Resolve  $(x^2 + y^1)(x^2 + z^2)(y^2 + z^2)$  into the sum of two squares.

I. Solution by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

By Euler's theorem we have

$$\begin{aligned}(x^2 + y^2)(x^2 + z^2) &= (x^2 + yz)^2 + (xz \mp xy)^2 = A^2 + B^2. \\ (x^2 + y^1)(x^2 + z^2)(y^2 + z^2) &= (A^2 + B^2)(y^2 + z^2) = (Ay \pm Bz)^2 + (Az \mp By)^2 \\ &= \frac{1}{2} (x^2 \pm yz)y \pm (z \mp y)xz \mp \frac{1}{2}^2 + \frac{1}{2} (x^2 \pm yz)z \mp (z \mp y)xy \mp \frac{1}{2}^2, \\ \therefore \text{ the sum of two squares in four ways.}\end{aligned}$$

II. Solution by the PROPOSER.

By determinants we have

$$\begin{aligned}(x^2 + y^2)(x^2 + z^2)(y^2 + z^2) &= \begin{vmatrix} x & -y \\ y & x \end{vmatrix} \begin{vmatrix} z & x \\ -x & z \end{vmatrix} \begin{vmatrix} y & z \\ -z & y \end{vmatrix} \\ &= \begin{vmatrix} xyz - xy^2 - x^2z - yz^2, & -x^2y - xz^2 - y^2z + xyz \\ x^2y + xz^2 + y^2z - xyz, & xyz - xy^2 - x^2z - yz^2 \end{vmatrix} \\ &= (xyz - xy^2 - x^2z - yz^2)^2 + (x^2y + xz^2 + y^2z - xyz)^2,\end{aligned}$$

[Other forms can be similarly obtained.—EDITOR].

Also solved by John Faught, M. A. Gruber, J. Scheffer, and C. D. Schmitt.

37. Proposed by H. M. CASH, Gibson, Ohio.

The area of the segment of a circle = *c*, and radius = *r*. Find height of segment.